WHAT IS CLAIMED IS:

1. A process for forming an in-plane switching mode liquid crystal display (IPS-LCD), comprising steps of:

providing a substrate made of an insulating material;

forming a first conductive layer on a first side of said substrate, and defining a gate conductive structure, and a bus portion of a common electrode;

forming a tri-layer structure consisting of a gate insulation layer, a semiconductor layer, and an etch stopper layer;

defining an etch stopper structure with a portion of said semiconductor layer exposed;

forming a highly doped semiconductor layer, and defining a contact via for interconnection to said bus portion of said common electrode;

forming a second conductive layer, and defining source/drain regions, a data line, a pixel portion of a data electrode, and a pixel portion of said common electrode with said etch stopper structure and said gate insulation layer as a stopper, wherein said pixel portion of said common electrode is interconnected to said bus portion of said common electrode through said contact via; and

forming a passivation layer, and defining a pixel region for exposing said pixel portions of said data and common electrodes.

2. The process according to claim 1 wherein a storage-capacitor portion of said common electrode is simultaneously defined together with said gate conductive line and said bus portion of said common electrode.

3. The process according to claim 2 wherein a storage-capacitor portion of said data electrode is simultaneously defined together

with said source/drain regions, said data line, said pixel portions of said data and common electrodes.

4. The process according to claim 3 wherein a storage capacitor consisting of said storage-capacitor portion of said data electrode and said storage-capacitor portion of said common electrode is disposed between a boundary of said pixel region and said gate conductive line.

5. The process according to claim 1 wherein said pixel portions of said common and said data electrode structures are both of a comb shape, and arranged opposite to each other with alternate comb teeth.

6. The process according to claim 1 wherein said first conductive layer is formed of a material selected from a group consisting of chromium, molybdenum, tantalum molybdenum, tungsten molybdenum, tantalum, aluminum, aluminum silicide, copper and a combination thereof.

7. The process according to claim 1 wherein said insulation layer is formed of a material selected from a group consisting of silicon nitride (SiN_x), silicon oxide (SiO_x), silicon oxynitride (SiO_xN_y), tantalum oxide (TaO_x), aluminum oxide (AlO_x), and a combination thereof.

8. The process according to claim 1 wherein said etch stopper layer is formed of a material selected from a group consisting of silicon nitride (SiN_x), silicon oxide (SiO_x) and silicon oxynitride (SiO_xN_y).

9. The process according to claim 1 wherein said semiconductor layer is formed of a material selected from a group consisting of intrinsic amorphous silicon, micro-crystalline silicon and polysilicon.

10. The process according to claim 1 wherein said doped semiconductor

layer is formed of a material selected from a group consisting of highly doped amorphous silicon, highly doped micro-crystalline silicon and highly doped polysilicon.

11. The process according to claim 1 wherein said second conductive layer is formed of a material selected from a group consisting of indium tin oxide, indium zinc oxide and indium lead oxide.

12. The process according to claim 1 wherein said passivation layer is formed of a material selected from a group consisting of silicon nitride and silicon oxynitride.

13. The process according to claim 1 wherein said insulating substrate is a light-transmitting glass.

14. The process according to claim 1 wherein said second conductive layer is a composite layer including a transparent electrode layer and a metal layer overlying said transparent electrode layer.

15. The process according to claim 14 wherein a portion of said metal layer in said pixel region is removed after said data electrode and said pixel portion of said common electrode are exposed.

16. The process according to claim 15 wherein said metal layer is formed of a material selected from a group consisting of chromium, molybdenum, tantalum molybdenum, tungsten molybdenum, tantalum, aluminum, aluminum silicide, copper and a combination thereof.

17. The process according to claim 15 wherein said transparent electrode layer is formed of a material selected from a group consisting of indium tin oxide, indium zinc oxide and indium lead oxide.

18. The process according to claim 15 wherein said step for defining

said etch stopper structure includes sub-steps of:

forming a photoresist layer on said tri-layer structure;

providing an exposing source from a second side of said substrate opposite to said first side by using a remaining portion of said first conductive layer as a shield to obtain an exposed area and an unexposed area; and

removing said photoresist and said etch stopper layer of said exposed area so that the remaining portion of said etch stopper layer in said unexposed area has a specific shape substantially identical to the shape of said remaining portion of said first conductive layer, thereby exposing a portion of said semiconductor layer of said exposed area.

19. An in-plane switching mode liquid crystal display (IPS-LCD), comprising:

a first insulating substrate;

a second insulating substrate;

liquid crystal molecules sandwiched between said first and second insulating substrates;

a thin film transistor (TFT) structure disposed on said first insulating substrate;

a common electrode structure disposed at said first insulating substrate, and including a pixel portion and a storage-capacitor portion;

a data electrode structure disposed on said first insulating substrate, electrically connected to a source electrode portion of said TFT structure, and including a pixel portion and a storage-capacitor portion; and

a passivation structure overlying said TFT, common electrode and data electrode structures with a pixel aperture exposing said pixel portions of said common and data electrode structures;

wherein a storage capacitor consisting of said storage-capacitor portions of said common and data electrode structures is disposed between a boundary of said pixel aperture and a gate conductive line of said TFT structure.

20. The IPS-LCD according to claim 19 wherein said common electrode structure further includes a bus portion.

21. The IPS-LCD according to claim 19 wherein said pixel portions of said common and data electrode structures are formed with the same transparent electrode layer.

22. The IPS-LCD according to claim 21 wherein said transparent electrode layer is formed of a material selected from a group consisting of indium tin oxide, indium zinc oxide and indium lead oxide.

23. The IPS-LCD according to claim 19 wherein said pixel portions of said common and data electrode structures are formed with the same composite layer consisting of a transparent electrode layer and a metal layer.

24. The IPS-LCD according to claim 23 wherein said metal layer is formed of a material selected from a group consisting of chromium, molybdenum, tantalum molybdenum, tungsten molybdenum, tantalum, aluminum, aluminum silicide, copper and a combination thereof.

25. The IPS-LCD according to claim 23 wherein said transparent electrode layer is formed of a material selected from a group consisting of indium tin oxide, indium zinc oxide and indium lead oxide.

26. The IPS-LCD according to claim 19 wherein said passivation

structure is formed of a material selected from a group consisting of silicon nitride and silicon oxynitride.

27. The IPS-LCD according to claim 19 wherein said first and second insulating substrates are formed of light-transmitting glass.

28. The IPS-LCD according to claim 19 wherein said pixel portions of said common and said data electrode structures are both of a comb shape, and arranged opposite to each other with alternate comb teeth.